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RECORD OF REVISIONS

Rev	Date	Description	POC	OIC
0	8/16/04	Initial issue.	Kelly Bingham, *FWO-DECS*	Gurinder Grewal, *FWO-DO*

Contact the Welding Standards POC for upkeep, interpretation, and variance issues

GWS 1-03	**Welding POC / Committee** **http://www.lanl.gov/f6stds/pubf6stds/engrman/HTML/poc_techcom1.htm#weld**

GWS 1-03 WELDING AND BRAZING MATERIAL PROCUREMENT & CONTROL

1.0 PURPOSE AND SCOPE

1.1 Purpose

A. To establish and to define consumable welding material procurement and control requirements for the LANL Welding Program in compliance with engineering drawings and specifications, applicable codes and standards, and contract requirements.

1.2 Scope

A. The scope of this procedure is the procurement and control of weld filler material and welding and purge gases to be used for all welding activities performed by LANL personnel, and to subcontractors at LANL as invoked by contract documents, in accordance with Reference 1.

2.0 REFERENCES

1. GWS 1-01, *Introduction & Scope*
2. GWS 1-05, *Welder Performance Qualification / Certification*
3. GWS 1-07, *Material Specifications*
4. GWS 1-09, *Control of Subcontracted Welding*
5. SUP-1 Form 838c, *Procurement Quality Requirements*

3.0 ACRONYMS AND DEFINITIONS

Acronym / Term	Description
Certificate of Compliance (C of C)	A signed and dated document that attests to the specifications, characteristics, or attributes of an item or service, or the source material or feedstock for the item, and is provided as an affirmation that the described requirements as specified in the contract or purchase order have been satisfied. [LIR 308-00-04.2] If the filler material manufacture has the capability to label the filler material containers with a Certificate of Compliance, in accordance with ASME SFA or AWS requirements, a separate document is not required.
Certified Material Test Report (CMTR) or Certificate of Analysis (C of A)	A certificate issued by the original fabricator of the material, part, or equipment which is traceable to the shipment through a unique identification number and which indicates measured chemical and physical properties as specified in the procurement contract and that the test(s) were performed to applicable nationally recognized standards. [LIR 308-00-04.2]

Acronym / Term	Description
SFA	AWS A5.XX series filler material specification that has been officially adopted by ASME B&PV Code.
Welding Consumables	Materials required by a Welding Procedure Specification (WPS), Welding Fabrication Procedure (WFP), or Welding Technique Sheet (WTS) to produce a welded or brazed joint. These materials include, but are not necessarily limited to: coated electrodes, bare filler rods and wire, flux-cored spooled wire, metal core electrodes, fluxes, gasses, pre-placed consumable inserts, etc.

4.0 GENERAL

4.1 Responsibilities

A. The **LANL FWO Welding Program Administrator (WPA)** is responsible for maintenance and implementation of this section and to provide technical assistance to departments in procurement, storage, issue and control of consumable welding materials filler materials.

B. The **LANL PS-1 Institutional Quality Management Group (IQMG**) is responsible for surveillance, auditing, and verification activities relating to procurement, receiving, issue, and control of consumable welding filler materials as delineated in this section.

C. The **LANL Project / Managers** are responsible for the administration, implementation, and compliance to this section on projects or programs under their jurisdiction, in accordance with GWS 1-01, *Introduction & Scope*; and GWS 1-07, *Material Specification.*

D. The **SSS and other Subcontractors to or for LANL** are responsible for the administration, implementation, and compliance to this section for their assigned contracts in accordance with contract requirements; GWS 1-01; and GWS 1-09, *Control of Subcontracted Welding*.

5.0 PROCEDURE

A. Except for special chemistry[1] materials, all welding and brazing electrodes and wire, including granular fluxes for Submerged Arc Welding (SAW), shall be purchased in accordance with the latest requirements of ASME B&PVC Section II, Part C and/or AWS A5.01 Filler Metal Procurement Guidelines.

5.1 Procurement of Welding Consumables by or for LANL

Guidance: The SSS has been tasked to stock bulk quantities of certified filler material for use by LANL, themselves, and subcontractors for whom filler material is to be government furnished by contract. They will disburse daily quantities to those with proper paperwork (see 5.5 below); they will also issue bulk quantities to those maintaining satellite and issue stations provided the field station controls have been reviewed and approved by the WPA or PS-1. A list of stocked filler material maintained by the SSS is at http://intranet.jci.lanl.gov/dept/oa/qa/welding.htm

[1] Special Chemistry Filler material is a filler material that does not have an AWS Classification.

A. Procurement of Filler Materials shall comply with the following:

1. Welding Filler Materials as defined in Section 3.0 "Welding Consumables" of this document purchased by or for use by LANL or the SSS shall be procured with CMTRs following the guidance of AWS 5.01, *Filler Metal Procurement Guidelines*, Table 2, Schedule I - Required Tests (by AWS Specification). The CMTR shall include the actual results of all chemical analyses, mechanical tests, and examinations as required by Schedule-I, and shall be traceable by Lot, Batch, or Heat Number to the material delivered for use (See Attachment 5 for AWS 5.01, *Filler Metal Procurement Guidelines,* Table 2, Schedule I - Required Tests).

1. Low Hydrogen SMAW Electrodes (EXXX5, EXXX6, and EXXX8) shall meet diffusible hydrogen of 4 mL/100grams of deposited weld metal maximum and shall be labeled with the designator H4 as outlined in AWS 5.1 or 5.5 Specifications.
2. Low Hydrogen FCAW Electrodes (EXXT-X) shall meet diffusible hydrogen of 8 mL/100grams of deposited weld metal maximum and shall be labeled with the designator H8.
3. Welding filler material used for ASME Section I BEP (Boilers and Boiler external piping), ASME Section III, ASME Section VIII, and ASME B31.3 Category K and M, Safety Class, Safety Significant, VSS, defense in depth, ML-1, and ML-2, welding procedure qualification tests, or Project/Program when specified, shall maintain traceability through the point of use and then filed in the project/program/facility files.
4. Procurement documents (SUP-1 Form 838c) shall require the manufacturer or vendor to supply a Certified Material Test Report (CMTR) for the materials.
5. A Certificate of Compliance (C of C) may be substituted for a CMTR if permitted by the engineering specification, engineer-of-record, or Project / Manager. The C of C shall state that the welding consumables were manufactured in accordance with the requirements of the appropriate material specification for each material type, size, heat, and lot number. The manufacturer or vendor may fulfill this requirement by labeling each container with a statement that the material conforms to the appropriate ASME SFA, AWS, or Engineering specification. If the containers are not labeled, the supplier or manufacturer shall provide a written C of C on supplier or manufacturer letterhead.

B. Special chemistry weld filler materials not included in ASME SFA or AWS specifications shall be purchased only after LANL Welding Program Administrator or LANL Engineering Standards Manager approval and shall be procured with CMTRs along with any additional requirements specified in the purchase order.

C. A list of weld filler material types and corresponding AWS classification or ASME SFA specification numbers is provided in GWS 1-07, *Material Specifications*.

D. Procurement of gases used for welding or purging shall comply with the following:

1 All gases shall be procured with C of A's to meet the purity and dew point requirements of the applicable gas(es) as listed in AWS 5.32, *Specification for Welding Gases*; Table 1. The C of A's shall include the actual results of all purity analyses, dew point, and shall be traceable by bottle, dewar, or bulk system manifold to the material delivered (see Attachment 6 for AWS 5.32, *Specification for Welding Gases*; Table 1 Gas Type, Purity, and Dew Point Requirements.)

2 All gas containers shall either be evacuated or, if not evacuated, residual gases shall be analyzed for composition and purity prior to filling.

3 Each gas of multi-component gas mixture shall be tested for and meet the purity requirements of each specific gas as listed in Table 1.

4 The multi-component gas mixture shall meet the dew point requirement not greater than the highest dew point of the individual gases in the mixture.

5 Procurement documents (SUP-1 Form 838c) shall require the manufacturer or supplier to provide a Certificate of Analysis Report (C of A) for gases in accordance with Attachment 6.

6 Welding gases used for ASME Section I BEP (Boilers and Boiler external piping), ASME Section III, ASME Section VIII, and ASME B31.3 Category K and M, Safety Class, Safety Significant, VSS (Defense in Depth), welding procedure qualification tests, or Project/Program when specified, shall maintain traceability through the point of use and then filed in the project/program/facility files.

7 A Certificate of Compliance (C of C) may be substituted for a C of A if permitted by the engineering specification, engineer-of-record, or Project / Manager. The C of C shall state that the gases are in accordance with the requirements of the appropriate material specification for each gas. The supplier shall provide a written C of C on supplier or manufacturer letterhead.

5.2 Program Implementation

A. All weld filler material shall be inspected for shipping damage by LANL PS-1 Receipt Inspection or SSS QC Inspectors. Any damaged material shall be identified and properly dispositioned prior to release for use.

B. Certified Material Test Reports or Certificates of Analysis shall be checked against the original purchase order requirements and verified against the chemical and mechanical requirements of the ASME SFA or AWS specification. Discrepancies shall be identified and brought to the attention of the LANL WPA for disposition prior to the release of any material.

C. Weld filler material shall be stored in hermetically sealed containers in a clean, dry enclosed controlled area. The area shall have uniform heating and temperature control to prevent condensation or corrosion. Minimum temperature shall be 40 ºF (5 ºC) with a maximum temperature of 140 ºF. Welding materials shall not be in direct contact with concrete floors and shall be stored on pallets or bins segregated by weld filler material type and size. Multiple stacking of pallet or boxes should be avoided to prevent damage to storage containers.

D. Bags of granular flux or spooled wire shall be laid flat on pallets or boards, and maintained in their weather-proof storage packets or bags.

E. Electrodes, wires, etc., shall be stacked separately and segregated from each other, i.e., stainless steel electrodes shall not be stored with carbon steel electrodes and E6010 electrodes shall not be stored with E7018 electrodes.

F. Wherever possible, different heat numbers or control numbers of a single type of welding material (i.e. E7018) shall be grouped within the stack or kept on separate shelves.

5.3 Local or Field Satellite Storage Areas

A. Local storage, including field satellite or tool room areas shall be clean, dry and weather tight. Sufficient space and electrical power shall be provided to support electrode storage ovens as well as portable rod ovens or heaters. Access shall be controlled at all times. Issue station or tool room conditions shall be maintained in accordance with § 5.2C, D, and E.

5.4 Storage Oven Requirements

A. Coated electrodes of the low-hydrogen type, including series EXXX5, EXXX6 and EXXX8 (such as E7018, E8018-B2L, etc.), shall be stored in welding electrode storage ovens once the hermetically sealed container has been opened. Storage ovens shall be maintained in accordance with Attachment 1 and the following:

1. Each storage oven shall have a tag or label placed on the door identifying the electrodes stored in each section of the oven.
2. The exposure limits described in Attachment 1 shall be followed for all welding material types.

5.5 Weld Filler Material Issue and Control

A. **Issue Stations:** The LANL or SSS Project / Program Manager or Facility Manager shall determine whether the project size, manpower, scope, and duration warrant a weld filler material issue station staffed by an attendant. If a weld filler material issue station is not implemented at the project, the LANL or SSS Project / Program Manager or Facility Manager shall ensure that weld filler materials are issued in a manner that will assure appropriate control. Weld filler materials shall not be stored in craft gang boxes, lockers, vehicles, or left in work areas overnight or for the next shift. Unused weld filler materials shall be returned to a storage oven or storage area at the completion of the work assignment or end of shift, whichever occurs first.

B. **Welding Material Requisition:** LANL or SSS Project / Managers or Facility Managers shall use the Weld Material Requisition (Attachment 2) -- a three part form with white original, pink and yellow copies -- to authorize the specific AWS Designation, size, and quantity of filler material the issue station or tool room attendants can issue to welders. In addition, an IWD shall accompany the weld material requisition or must be on file with the tool room attendant in order to verify that the welders are certified, the process and filler material is correct. The IWD or accompanying work package shall include:

1. applicable codes and standards or design requirements (such as project specifications and or drawings) if there are no codes,
2. welding procedures specifications that will be used for welding,
3. names and Z # of certified welders who will be welding,
4. correct filler(s) materials to be used,
5. required hold points and inspections to meet applicable codes or design

C. A certified welding inspector or WPA-qualified SME shall verify that the IWD is correct and complete and will sign off as the SME on the IWD. The tool room attendant or designated person shall verify the IWD to the material requisition form on filler material and welder names and then will issue material if appropriate. Exempted applications shall be noted on the IWD and signed off by the CWI or SME. The tool room attendant shall verify that the welding is exempted and issue filler material as outlined under Weld Material Issue section below. Control of the filler material is required to be in place with exempted welding. The original records shall be kept in the job project documentation package until project completion. A copy shall be kept with the tool room attendant and a copy forwarded to the Welding Program Administrator or designee (e.g., SSS) for continuity updates for the welders. After project completion the records shall be forwarded to the facility or project/program record files for retention.

Guidance Note: A test will generally be administered to determine SME qualification.

D. **Weld Material Issue:** The issue station or tool room attendant shall complete the information listed on the Weld Material Issue Card (Attachment 3), including the useful lifetime (without further preservation for low hydrogen electrodes) of the material being issued.

E. Weld filler materials that exhibit any of the following conditions shall not be issued:

1. visible damage,
2. covered electrodes which are oil or water soaked, dirty, or on which the flux has cracked or separated from the core wire,
3. bare and flux-cored wire that contains rust, is pitted, or has been oil or water soaked, or
4. electrodes from a hermetically-sealed container whose seal has been broken during shipping or handling.

F. Welders shall not be issued more than one ASME SFA or AWS classification of electrode or weld filler material at any one time. However, when the Welding Fabrication Procedure or Welding Technique Sheet requires more than one welding process or weld filler material type, weld filler metal and electrodes for both processes may be issued at the same time, provided the welder is qualified for both processes. Quantities of weld filler material shall be based on the amount estimated for use on a daily shift basis.

G. Initial issuance of electrodes may either be directly from the sealed containers or storage ovens into portable rod ovens or heaters. Electrodes issued from storage ovens shall be on approximately a first-in, first-out basis.

H. At the time of issue, the welder shall be instructed to examine the weld filler material to assure compliance with the material listed on the Weld Material Issue card.

I. Quantities and types of weld filler materials for use in the Welder Qualification Test facility shall be obtained or procured by the responsible Weld Test Supervisor. Quantities may be obtained or procured as required and stored in the Weld Test Facility. The responsible Weld Test Supervisor shall control exposure times and storage ovens for coated electrodes. Weld Material Requisitions/Issue and Return Cards are not required for welders in the test facility. Only the Weld Test Supervisor shall issue weld filler materials to the welder. See GWS 1-05, *Welder Performance Qualification / Certification*.

J. The LANL or SSS Project / Manager or Facility Manager shall ensure by delegation that the Issue Station or Tool Room Attendant:

1. Issues only the filler metal type and size listed on the Weld Material Requisition.
2. Accurately and legibly records issue transactions on the Weld Material Issue Card and Weld Material Return Card.
3. Maintains weld material identification tags or labels on or in weld material storage ovens or bins.
4. Stores weld material by type and size in ovens or bins whereby the material stored corresponds to the material identification tag or label.
5. Checks the storage oven temperature daily to assure that the oven is functioning and operating at the proper temperature with a calibrated thermometer or other calibrated measuring temperature device (documentation of this check is not necessary).
6. Uniquely numbers or otherwise identifies ovens and or storage bins
7. Maintains the CMTRs or C of Cs for the filler material. Copies can be made and placed in the project package if needed.

K. In the event of a power outage to the storage ovens, the electrodes, except for the situations described below, shall be discarded or referred to the LANL WPA for resolution.

1. E7018 and E8018 Series Electrodes – If the power outage is 4 hours or less, or if it can be established that the oven temperature did not fall below 120 °F, return the oven to the specified temperature. The electrodes may be issued in the usual manner.
2. E9018, E10018, and E11018 Series Electrodes – If the power outage is 2 hours or less, or if it can be established that the oven temperature did not fall below 160 °F, return the oven to the specified temperature. The electrodes may be issued in the usual manner.
3. Electrodes Other Than Low-Hydrogen Electrodes – If the power outage is 24 hours or less, return the oven to the specified temperature. The electrodes may be issued in the usual manner.

L. Portable rod ovens or heaters shall be used by the welder at the work area when EXX18 and EXXX18 series (low-hydrogen) electrodes will be exposed to the ambient environment for periods exceeding the maximum exposure time listed in Section 5.7 and the following:

1. Portable rod ovens for EXX18 and EXXX18 series electrodes shall have the thermostats set between 250 °F and 350 °F.
2. Prior to use, the portable rod oven shall be clean and dry. Portable rod ovens in service at welding locations shall be connected to a power supply and energized. Welders shall be instructed or trained to determine whether the portable oven is energized. A red indicator light or temperature indicator on the portable oven may be used to determine whether it is energized. If a welder notices that the oven has cooled below "warm to the hand" temperature or the portable oven is not working, the portable rod oven and all remaining weld filler material shall be returned to the issue station. See preceding paragraph for temperature requirements.

5.6 Control of Welding Filler Material during Welding

A. Responsible LANL supervisors or SSS craft foremen shall instruct welders in the following production controls and ensure that they are met.

B. Upon reaching the work location, the welder may transfer low-hydrogen electrodes from the portable oven to a leather pouch or other clean and dry holder. Portable rod ovens shall be closed at all times, except when removing electrodes. Electrodes shall not be put back into the portable oven after they have been removed.

C. Waste ends, stubs, and low-hydrogen electrodes exceeding the exposure requirements of Section 5.7 shall be properly discarded by the welder in a scrap or trash bin.

D. The welder shall not weld with low-hydrogen electrodes that have exceeded the exposure times indicated in Section 5.7. This may require posting low-hydrogen electrode exposure times. The welder shall return these electrodes to the issue station for proper logging and disposal.

E. The welder shall return weld filler material as noted in Paragraph 5.8.A.

F. Welding materials shall not be left lying around where inadvertent or intentional use is possible. Spooled wire left on wire feed units shall be protected from damage and contamination.

G. At all times through point of consumption, bare wire in straight lengths shall retain the manufacturer's flag tag or identification; spooled wire shall retain the spool identification.

5.7 Low-Hydrogen Electrode Exposure Time Limits

A. Low-hydrogen electrodes shall not be exposed to the ambient environment for a time exceeding the exposure limits in Attachment 1.

B. Low-hydrogen electrodes maintained in heated portable rod ovens or storage ovens shall not be considered as having been exposed to the ambient environment.

C. Alternative Atmospheric Exposure Periods Established by Test: The alternative exposure time values shown in AWS D1.1 Table 5.1 Column B may be used provided testing establishes the maximum allowable time. The testing shall be performed in conformance with AWS A5.5, Subsection 3.10 for each electrode classification and each electrode manufacturer, and meet all the requirements in AWS A5.5 and be less than the maximum values listed Table 9. In addition, E70XX and E70XX-X (AWS A5.1 & A5.5) shall be limited to maximum moisture content not exceeding 0.04% by weight.

5.8 Return and Reissue Requirements for Welding Filler Materials

A. Unused weld filler material, except as noted in Sections 5.6.B and 5.8.C, shall be returned by the welder with the Weld Material Return Card (Attachment 3; Note: Weld Material Return Card is on the back side of the Weld Material Issue Card) to the issue station at the close of the shift or completion of the work assignment.

1. The issue station or tool room attendant shall complete the information listed on the Weld Material Return Card and sign in the "Received by" line

B. Coiled, bare, or flux-cored wire mounted on semiautomatic or automatic welding machines need not be returned at the close of the shift, provided that the wire is covered and protected (kept clean and dry) and will be used within 48 hours. The wire shall be returned to the issue station when the work is completed or the end-of-shift, whichever occurs first.

1. Alternatively, a Weld Wire Usage Log (Attachment 4) maybe filled out for each machine on which wire is stored for use.

C. Low-hydrogen electrodes returned to the issue station in a portable rod oven (which have not been exposed to the ambient environment) shall be logged in and placed in a storage oven. These electrodes shall not be issued for a minimum of 8 hours. This may require maintaining separate storage ovens for each shift to provide proper control.

D. Low-hydrogen electrodes that have been exposed to the ambient environment, but are returned prior to exposure time limits (see Section 5.7), shall be placed in a separate storage oven. These electrodes shall not be issued for a minimum of 8 hours. When reissuing these electrodes, the Weld Material Return Card shall indicate that they have been exposed to the ambient environment. These electrodes shall be returned to the issue station and logged in, then discarded.

   Note: When low-hydrogen electrodes are being transferred from their shipping container to the storage oven or portable rod oven and vice-versa, the electrodes shall not be considered as having been exposed to the ambient environment.

E. Other covered electrodes that are returned shall be placed in their storage area or oven until they are reissued.

F. Bare wire, flux-cored wire, and other weld filler materials shall be placed in their storage location until they are reissued.

6.0 ATTACHMENTS

ATTACHMENT 1: ELECTRODE/STORAGE/CONDITIONING AND EXPOSURE LIMITS

ATTACHMENT 2: WELD MATERIAL REQUISITION

ATTACHMENT 3: WELD MATERIAL ISSUE CARD/ WELD MATERIAL RETURN CARD (BACKSIDE OF ISSUE CARD)

ATTACHMENT 4: WELD WIRE USAGE LOG

ATTACHMENT 5: AWS A5.01 FILLER METAL PROCUREMENT GUIDELINES, TABLE 1, SCHEDULE I – REQUIRED TESTS

ATTACHMENT 6: AWS A5.32 SPECIFICATION FOR WELDING GASES, TABLE 1, GAS TYPE, PURITY, AND DEW POINT REQUIREMENTS.